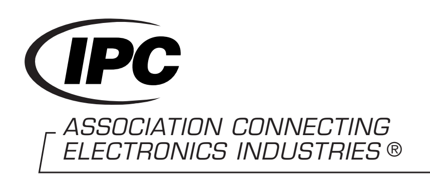


IPC-2582

Sectional Requirements for Implementation of Administrative Methods for Manufacturing Data Description



Endorsed by the International Electronics Manuafacturing Initiative (iNEMI)

IPC-2582

May 2007

A standard developed by IPC

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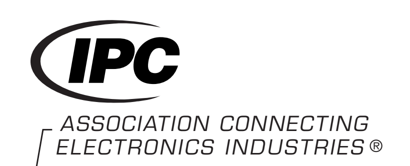
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IPC-2582

Sectional Requirements for Implementation of Administrative Methods for Manufacturing Data Description

Developed by the CAD/CAM Convergence Subcommittee (2-17) of the Data Generation and Transfer Committee (2-10) of IPC

Users of this publication are encouraged to participate in the development of future revisions.

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Acknowledgment

Any document involving a complex technology draws material from a vast number of sources. While the principal members of the CAD/CAM Convergence Subcommittee (2-17) of the Data Generation and Transfer Committee (2-10) are shown below, it is not possible to include all of those who assisted in the evolution of this standard. To each of them, the members of the IPC extend their gratitude.

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TABLE OF CONTENTS

Sectional Requirements for Implementation of Administrative Methods for Manufacturing Data Description

INTRODUCTION

This standard is part of the IPC-2580 series of standards. These standards specify a data file format used to describe printed board and printed board assembly products with details sufficient for tooling, manufacturing, assembly, inspection and testing requirements. The format may be used for transmitting information between a printed board designer and a manufacturing or assembly facility. The files are also useful when the manufacturing cycle includes computer-aided processes and numerical control machines.

The IPC-2580 format requirements are provided in a series of standards focused on design printed board fabrication, assembly, inspection, and testing. This standard series consists of a generic standard (IPC-2581) which contains all the general requirements. There are seven sectionals that are focused on the details necessary to accumulate information in a single file that addresses the needs of the manufacturing disciplines producing a particular product.

The sectional standards (IPC-2582 through 2588) paraphrase the important detailed requirements and provide suggested usage and examples for the topic covered by the sectional standard. The information can be used for both manual and for digital interpretations. The data is defined in either English or International System of Units (SI) units.

1 SCOPE

This standard (IPC-2582) provides the information on administrative requirements used for the ordering, request for quote, or asking for changes to a particular printed board or printed board assembly. Since the requirements are important to every file in order to understand the file usage the XML schema is reused in every Business to Business transaction. This standard calls out the details defined in the generic standard (IPC-2581) that are required to accomplish these focused tasks.

1.1 Intent

The IPC-2581 contains all the requirements necessary to build an electronic product. The cardinality indicated in the IPC-2581 may be superseded by a restriction of an attribute (enumerated string ID) or indication of a requirement that is noted as being optional in the generic standard, however this standard makes the requirement mandatory based on the supply chain communication need.

In order to assist the users of this standard, all the applicable XML schema elements that apply to the Administrative Function are listed in Appendix A. The list is grouped by topics and shows the Absolute Path for the elements that pertain to the focus of this standard. If the Parent element is not present no children are to be considered in the implementation, however all Attributes identified for a particular element **shall** follow the cardinality of the IPC-2581 unless a restriction is stated in this standard.

1.2 Interpretation

"**Shall**", the emphatic form of the verb, is used throughout this standard whenever a requirement is intended to express a provision that is mandatory. Deviation from a **shall** requirement is not permitted, and compliance testing is required in order to demonstrate that the XML instances are correct according to the W3C directives and this standard. The XML schema **shall** be the method to check syntax and semantics. Any appropriate software tool that prompts the user, to correct the ambiguity or to insert missing information, may be used for this purpose.

The words "should" and "may" are used whenever it is necessary to express non-mandatory provisions.

"Will" is used to express a declaration of purpose.

To assist the reader, the word **shall** is presented in bold characters

2 APPLICABLE DOCUMENTS

The following documents contain requirements which, when referenced, constitutes provisions of IPC-2582. At the time of publication, the editions indicated were valid. All documents are subject to revision and parties entering into agreements based on this standard are encouraged to investigate the possibility of applying the most recent additions of the documents indicated below.

The revision of the document in effect at the time of solicitation **shall** take precedence.

IPC-T-50 *Terms and Definitions for Interconnecting and Packaging Electronic Circuits.*

IPC-2581 *Generic Requirements for Printed Board Assembly Products Manufacturing Description Data and Transfer Methodology*

IPC-2589 *Sectional Requirements - Activity Model for Printed Board Assembly Products Manufacturing*

3 REQUIREMENTS

The requirements of IPC-2581 are a mandatory part of this standard. That document describes the generic requirements for the converged GenCAM and ODB++ formats. The generic details specifically provide data related to design, printed board manufacturing, assembly and test.

The XML schema of the 2581 consists of six major Elements each of which have several children who then become new parent elements. Several of these major elements and their associated new parents are defined in this standard. The general requirements of the administration details are indicated in the generic standard as to their cardinality, however when they are combined with other schema detail there may be further restrictions imposed above and beyond the requirements or recommendations of this sectional standard.

Each of the sectional standards permits the indication of XML schema to define the characteristics of a specific function or task respectively, and although they may at times be used independently, they require administrative information in order for the data to be used intelligently. It, therefore, becomes an important part of the overall usage of any of the sectional standards as information is provided for design, board fabrication, assembly or testing descriptions.

Accordingly, the information interchange for the specific purpose of any manufacturing function is only possible if all the XML instances have been properly prepared for such a purpose.

3.1 Terms and Definitions

The definition of all terms **shall** be in accordance with IPC-T-50 and the following. A term number at the end of a line indicates that it is a reproduction from IPC-T-50 to assist the reader in interpretation of this standard.

3.1.1 Data Capture 25.0340

The automatic collection of information from a given machine or other information source.

3.1.2 Numerical Control (NC) (Machining) 25.1193

The automatic control of electromechanical devices by means of a digital input to an electronic controller.

3.1.3 Computer-Aided Manufacturing (CAM) 25.1361

The interactive use of computer systems, programs, and procedures in various phases of a manufacturing process wherein, the decision-making activity rests with the human operator and a computer provides the data manipulation functions.

3.1.4 Date Code 30.1739

Marking of products to indicate their date of manufacture.

3.1.5 Special Characters 70.2052

Nonalphabetic or numeric characters in a bar code symbol.

3.2 Categories and Content

Table 3-1 provides the major functions that **shall** be addressed by the 2582 standard. The descriptions relate to the appropriate information needed by most of the sectional standards. There are four (4) unique functions that can be defined by the use of the XML elements and the resulting XML instances. Each of the functions has additional child elements that may or may not be present as determined by the purpose of the data file, the maturity of the file, and the supply chain business transaction usage.

Table 3-1 indicates the relationships of the requirements for various elements and topics within the descriptions for a particular process. The letter **"M"** signifies a *mandatory* requirement. The letter **"O"** signifies an *optional* characteristic that may or may not be pertinent to the particular file or data interchange. A dash signifies an extraneous section (unnecessary); although software tools used to parse the file will permit the extraneous data, it is recommended that only the requirements identified as mandatory or optional are included in the file in order to reduce file size transfer.

Table 3-1 File Segmentation and Functional Requirements

Name	Full	Design			Fabrication			Assembly			Test		
		1	2	3	1	2	3	1	2	3	1	2	3
Content Elements	M	M	M	M	M	M	M	M	M	M	M	M	M
FunctionMode	M	M	M	M	M	M	M	M	M	M	M	M	M
StepNameRef	M	M	M	M	M	M	M	M	M	M	M	M	M
LayerNameRef	M	M	M	M	M	M	M	M	M	M	M	M	M
BomNameRef	M	M	M	M	O	M	M	M	M	M	O	M	M
AvlNameRef	M	O	O	M	O	M	M	O	M	M	-	O	M
DictionaryStandard	O	O	M	M	O	O	M	O	O	M	O	O	M
DictionaryUser	O	O	O	O	O	O	O	O	O	O	O	O	O
DictionaryFont	O	O	O	O	O	O	O	O	O	O	O	O	O
DictionaryLineDesc	O	-	O	M	O	O	M	O	O	M	-	-	O
DictionaryColor	O	-	O	O	-	O	O	-	-	O	-	-	-
DictionaryFirmware	O	-	-	O	-	-	-	O	M	M	O	M	M
Logistic Header elements	M	M	M	M	M	M	M	M	M	M	M	M	M
Role	M	M	M	M	M	M	M	M	M	M	M	M	M
Enterprise	M	O	O	M	O	M	M	O	M	M	O	M	M
Person	M	M	M	M	M	M	M	M	M	M	M	M	M
History Record Elements	M	O	M	M	O	M	M	O	M	M	O	M	M
HistoryRecord	M	O	M	M	O	M	M	O	M	M	O	M	M

The correlation between the various descriptions identified in this standard is indicated in Figure 3-1. This shows the relationship between CAD CAM tools and the Interface system needed to populate the required administration information of the 2581 file.

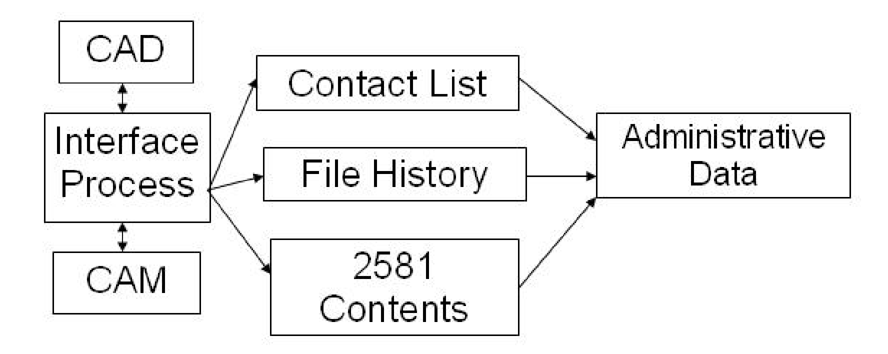


Figure 3-1 Administrative Configuration Management Structure

The normal capabilities of the CAD or CAM systems are to accomplish the design descriptions and the manufacturing requirements for board fabrication, assembly or testing functions. The administration data however is important for file verification and managing the different revision processes associated with the data. The Interface process is intended to provide the opportunity for the human interaction that provides the information necessary to establish the appropriate contact information or relationship of dictionaries that have been imported or are a part of the 2581 file.

Most important is the History record information which provides the User the information as to how many changes were made or what changes were recommended by the suppliers. The concepts are different from User to User and each have their individual techniques for maintaining configuration control of the products represented by the file. A revision system is established by the User and file management is accomplished using the interface system. Thus both CAD and CAM tools must have some capability to read and write variations of the 2581 file.

4 GENERAL RULES

The following details reflect the rules used in the IPC-2582 sectional to meet the requirements for administrative data. These rules are intended to meet the needs of the manufacturer to understand the customer requirements.

Wherever necessary, additional requirements have been detailed to reflect precision. The attributes and rules for the data file are described in IPC-2581 are required. Wherever necessary, detailed descriptions or definitions of the entities, attributes or characteristics are described according to the following paragraphs.

4.1 Administration

Administration data is used to control work generated from CAD files and sent to members of the supply chain. A basic data model exists as a part of administration data; this is the person model. The person model has the name, company, location, telephone number and associated data to provide easier communication when transmitting data files between a designer/engineer and a manufacturer.

The person model can be used in any of the transactions required and permits the multi-use of the same person performing similar administrative functions. The person model is applied to the following name as enumerated strings: SENDER, OWNER, RECEIVER, DESIGNER, ENGINEER, BUYER, CUSTOMERSERVICE, DELIVERTO, BILLTO, and OTHER. The only information needed is the name that has been established for the person. Thus, if only one person has been identified for all of the functions, the administration section would only convey one person, and that person's identification would list the various roles for which they have responsibility.

A critical role that **shall** be identified in every 2581 file is the function of OWNER. That identification establishes the name of the person responsible for answering questions and maintaining the revision levels associated with the initial release of the file. That person **shall** be the contact for any

modifications of the archived data. If the name of the original OWNER changes a revision should be made to the master file and all suppliers informed of the change.

4.2 Content Element

The `Content` element is a mandatory part of the 2582 file. The information should be consistent with IPC-2581. The `Content` element defines the function of the file, and references the major sections of the product description (e.g., `Step`, `Layer`, `Bom` and `Avl`). In addition, there are six dictionaries indicated in `Content` that would contain the pre-described information needed for the file details.

4.2.1 FunctionMode

The `FunctionMode` should meet the requirements of IPC-2581. Each `FunctionMode` has a specific purpose defined for the industry. The `FunctionMode` element has three attributes. The first is `mode`, which can be the enumerated strings of DESIGN, FABRICATION, ASSEMBLY, TEST and FULL. In many instances, the testing function is already included in fabrication and assembly modes consisting of bare board testing for fabrication, and in-circuit testing for assembly.

The `FunctionMode` permits multi-combinations of Design, Fab, Assembly and Test. As an example a FAB2 requirement could be combined with that of a TEST1 requirement in a single file.

4.2.2 StepRef

The `StepRef` element references all the `Step` elements located in the IPC-2581 file. There may be multiple references in the Content section. The `StepRef` element, as it appears in the `Content` schema, references the `Step` globally unique "name".

All the graphical data of a 2581 file are located inside `Steps` that can be nested inside each other (PCB/Sub Panel/Panel, etc.). Steps are referenced in the `Content` schema (`StepRef`) as a `string` that identifies the name assigned.

4.2.3 LayerRef

The `LayerRef` element references a single Layer located in the IPC-2581 file. There may be multiple references in the Content section. The `LayerRef` element, as it appears in the `Content` schema, references the `Layer` globally unique "name." Although the `Layer` element has additional attributes—layerFunction, side, and polarity—having these appear as a component in a composite key for this element is unnecessary due to the globally unique name.

The reference to the `Layer` descriptions should be in accordance with IPC-2581. Layers, as the name implies, are either logical layers of data or sheets of two-dimensional material that, when laid on top of each other, create the Printed Circuit Assembly (unpopulated PCB and components).

Layer descriptions usually correspond to the Step where the graphical data resides. The Purpose of a particular Step that has a corresponding Layer should correspond to the `layerFunction` attribute as recommended in IPC-2581.

4.2.4 BomRef

The Bill of Material information should be in accordance with IPC-2581 and is identified by a unique name. Each `BomRef` element as it appears in the `Content` schema, references one of the potentially many `Bom` categories and the number of items included in each category in the IPC-2581 file. There may be multiple references to individual Bom(s) in the `Content` section of the file with each Bom referenced by the globally unique "name."

4.2.5 AvlRef

The approved vendor list should be in accordance with IPC-2581 and is identified by a unique name. The `Avl` section describes the Approved Vendor List for the materials used to fabricate the board and

the assembly. The Avl is used by the customer, the fabricator and the assembler to coordinate the relationship with the bills of materials described in the IPC-2581 file. The AvlRef is referenced by its globally unique name. There is only one occurrence of the Avl reference.

4.2.6 DictionaryStandard

The Standard Dictionary should be in compliance with IPC-2581. The DictionaryStandard is intended to provide lookup information on predefined Standard Primitives. The DictionaryStandard is maintained as part of a substitution group schema. The intent is to have graphic descriptions available that are identified by their characteristics and a specific name (id).

4.2.7 DictionaryUser

The User Dictionary should be in compliance with IPC-2581. The DictionaryUser is intended to provide lookup information on predefined UserPrimitives. The DictionaryUser is maintained as part of a substitution group schema. The intent is to have graphic descriptions available that are identified by their characteristics and a specific name (id).

4.2.8 DictionaryFont

The Font Dictionary should be in compliance with IPC-2581. The DictionaryFont is intended to provide lookup information on predefined font descriptions when the standard Helvetica font is not used. The DictionaryFont is maintained as part of a substitution group schema. The intent is to have font descriptions available that are identified by their characteristics and a specific name (id).

4.2.9 DictionaryLineDesc

The Line Description Dictionary should be in compliance with IPC-2581. The DictionaryLineDesc is intended to provide lookup information on predefined line descriptions. The DictionaryLineDesc is maintained as part of a substitution group schema. The intent is to have line descriptions available that are identified by their characteristics and a specific name (id).

4.2.10 DictionaryColor

The Color Dictionary should be in compliance with IPC-2581. The DictionaryColor is intended to provide lookup information on predefined Color descriptions. The DictionaryColor is maintained as part of a substitution group schema. The intent is to have color descriptions available that are identified by their three color hues and intensity characteristics and a specific name (id).

4.2.11 DictionaryFirmware

The Firmware Dictionary should be in compliance with IPC-2581. The DictionaryFirmware is intended to provide lookup information on predefined CachedFirmware. The DictionaryFirmware is maintained as part of a substitution group schema. The intent is to have firmware descriptions available that are identified by their characteristics and a specific name (id).

4.3 Logistic Header Elements

The LogisticHeader information **shall** be in compliance with IPC-2581. The LogisticHeader element consists of information about the owner of the IPC-2581 file. It can be used for configuration management or contact information. The enterprise is also linked to the Bill of Material and the Approved Vendor List (IPC-2588).

The LogisticHeader describes information pertaining to ordering and delivery. This includes the role played by the individual providing ordering and delivery information, the title of the person responsible and the address and particulars of the enterprise.

4.3.1 Role

The Role description **shall** be in compliance with IPC-2581. A Role element declares a type of activity within an Enterprise. The attribute values of the Role based on the requirements of the activities performed by the role. The standard IPC role types are defined as ten enumerated strings. Only these may be used. They are: SENDER | OWNER| RECEIVER | DESIGNER | ENGINEER | BUYER | CUSTOMERSERVICE | DELIVERTO | BILLTO \ OTHER. If OTHER is used, it is recommended to complete the Description attribute.

4.3.2 Enterprise

The Enterprise description **shall** be in compliance with IPC-2581. The Enterprise is described by its id. The id uniquely identifies an enterprise throughout the IPC-2581 file. The id is a shortName data type (a restricted xsd: string) that must be unique within the global (top-level) namespace of the IPC-2581 file.

4.3.3 Person

The Person description **shall** be in compliance with IPC-2581. The Person is identified by a name and a reference to the enterprise and role within the company to which he belongs. The name is a string that uniquely identifies the person throughout the IPC-2581 file. The name must be unique within the global (top-level) namespace of the IPC-2581 file. It may be the full legal name or a known abbreviation.

Since the attribute "name" for person is identified as a string the actual instance may be any set of alphanumeric characters that work for a customer supplier relationship. This is especially important in those situations where a function is handled by more than one individual and any member of the team can respond to questions or enquiries.

4.4 History Record Elements

The HistoryRecord descriptions **shall** be in compliance with IPC-2581. The HistoryRecord element consists of changes performed on the file throughout its history. Several attributes are defined as part of the History as well as two elements. These are file revision and change records elements.

4.4.1 HistoryRecord

The HistoryRecord description provides a sequential change number for the IPC-2581 file. The number is changed every time the controlled version of the IPC-2581 file is modified. Only the file owner is allowed to change the value of HistoryRecord/number.

There are two children elements of the HistoryRecord.

4.4.1.1 FileRevision

The FileRevision information **shall** be in compliance with IPC-2581. The FileRevision element tracks changes to the IPC-2581 file. The revision identifier does not necessarily track the revision of the product. The purpose of the FileRevision is to track which software tools were used to make changes to the file and the sequence in which the changes were made.

4.4.1.2 ChangeRec

The ChangeRec description **shall** be in compliance with IPC-2581. The ChangeRec element is the information needed for configuration management of the changes made to the product that the data file represents. The characteristics are stored by the datetime that the change record was executed. The information can also be used to obtain approval of a suggested change.

There are two references to Person: one is for the personRef who initiated the change; the other personRef is for the individual who approved the change.

5 MODELING

The data files of the 2582 may be mapped to a UML data model. Data models are developed to ensure that complete mapping is capable between the information provided within the 2582 characteristics. The correlation is provided in the activity models shown in IPC- 2589.

All data activities are based on activity models as defined in IPC-2589. The activity models covered by CAD and CAM include the engineering, design, administrative, fabrication, assembly and testing characteristics.

6 REPORT GENERATORS

Data can be extracted from 2581 files to produce various formats that are commonly used in the electronics industry. The types of reformatting can be used for electronic data transfer to tools or to facilitate inspection and human interpretation of text and/or graphic rendering. Note that no extraction tools are included in the IPC-2580 standards however several tools have been developed that are downloadable from the IPC website.

The creation of data base manipulation tools is left to the industry as the need arises. An example report is very similar to an index card file and is established as shown in Table 6-1.

Table 6-1 Sample Report – Customer Directory

Name	Company	Address	City,State, PostalCode, Country	Phone	Fax	Email	Title
Bill Smith	ABC, Inc.	110 Cider Lane	Fuller Mills, Ohio 07032 USA	415-632-6760	415-632-1020	bsmith@abc.com	Engineer
Ralph Jones	XYZ Corp.	2213 1st Street	Tempe, AZ 90320	201-354-7300	201-755-2010	jones4@xyz.com	Designer

7 REFERENCE INFORMATION

The following sections define reference documents that are useful in clarifying the products or process of the industry or provide additional insight into the subject of data modeling or released information models.

7.1 IPC

IPC-2221 *Design Standard for Rigid Printed Boards and Rigid Printed Board Assemblies*

IPC-2615 *Printed Board Dimensions and Tolerances*

IPC-D-310 *Guidelines for Artwork Generation and Measurement Techniques for Printed Circuits*

IPC-D-325 *Documentation Requirements for Printed Boards, Assemblies and Support Drawings*

IPC-2611 *Generic Requirements for Electronic Product documentation*

7.2 American National Standards Institute

ANSI X3/TR-1-77 *American National Dictionary for Information Processing*

ANSI X3.12 *Subroutine Record Format Standardization*

ANSI Y14.5 *Dimensioning and Tolerancing for Engineering Drawing*

ANSI Y32.1 *Logic Diagram Standards*

ANSI Y32.16 *Electrical and Electrical Reference Designators*

ANSI Z210.1 *Metric Practice Guide (ASTM 380-72)*

7.3 Department of Defense

DoD-STD-100 *Engineering Drawings*

7.4 Electronic Industries Association

EDIF 4 0 0 *Electronic Data Interchange Format*

7.5 International Electrotechnical Commission (IEC)

IEC 61182-2 *Generic requirements for printed board and printed board assembly XML descriptions*

7.6 International Organization for Standards (ISO)

ISO STEP Documentation

AP210 *Electronic Printed Circuit Assembly: Drawings and Manufacturing*

AP211 *Electronic PC Assembly, Test Diagnostics & Remanufacture*

AP221 *Process Plant Functional Data & Schematic Representation*

APPENDIX A

ADMINISTRATIVE SCHEMA

IPC-2581

Content Elements
IPC-2581/Content
IPC-2581/Content/FunctionMode
IPC-2581/Content/StepRef
IPC-2581/Content/LayerRef
IPC-2581/Content/BomRef
IPC-2581/Content/AvlRef
IPC-2581/Content/DictionaryStandard
IPC-2581/Content/DictionaryStandard/EntryStandard
IPC-2581/Content/DictionaryStandard/EntryStandard/Butterfly
IPC-2581/Content/DictionaryStandard/EntryStandard/Circle
IPC-2581/Content/DictionaryStandard/EntryStandard/Contour
IPC-2581/Content/DictionaryStandard/EntryStandard/Contour/Polygon
IPC-2581/Content/DictionaryStandard/EntryStandard/Contour/Polygon/PolyBegin
IPC-2581/Content/DictionaryStandard/EntryStandard/Contour/Polygon/PolyStepCurve
IPC-2581/Content/DictionaryStandard/EntryStandard/Contour/Polygon/PolyStepSegment
IPC-2581/Content/DictionaryStandard/EntryStandard/Contour/Cutout
IPC-2581/Content/DictionaryStandard/EntryStandard/Contour/Cutout/PolyBegin
IPC-2581/Content/DictionaryStandard/EntryStandard/Contour/Cutout/PolyStepCurve
IPC-2581/Content/DictionaryStandard/EntryStandard/Contour/Cutout/PolyStepSegment
IPC-2581/Content/DictionaryStandard/EntryStandard/Diamond
IPC-2581/Content/DictionaryStandard/EntryStandard/Donut
IPC-2581/Content/DictionaryStandard/EntryStandard/Ellipse
IPC-2581/Content/DictionaryStandard/EntryStandard/Hexagon
IPC-2581/Content/DictionaryStandard/EntryStandard/Moire
IPC-2581/Content/DictionaryStandard/EntryStandard/Octagon
IPC-2581/Content/DictionaryStandard/EntryStandard/Oval
IPC-2581/Content/DictionaryStandard/EntryStandard/RectCenter
IPC-2581/Content/DictionaryStandard/EntryStandard/RectCham
IPC-2581/Content/DictionaryStandard/EntryStandard/RectCorner
IPC-2581/Content/DictionaryStandard/EntryStandard/RectRound
IPC-2581/Content/DictionaryStandard/EntryStandard/Thermal
IPC-2581/Content/DictionaryStandard/EntryStandard/Triangle
IPC-2581/Content/DictionaryUser
IPC-2581/Content/DictionaryUser/EntryUser
IPC-2581/Content/DictionaryUser/EntryUser/Arc
IPC-2581/Content/DictionaryUser/EntryUser/Arc/LineDesc
IPC-2581/Content/DictionaryUser/EntryUser/Arc/LineDescRef
IPC-2581/Content/DictionaryUser/EntryUser/Line
IPC-2581/Content/DictionaryUser/EntryUser/Line/LineDesc
IPC-2581/Content/DictionaryUser/EntryUser/Line/LineDescRef
IPC-2581/Content/DictionaryUser/EntryUser/Outline
IPC-2581/Content/DictionaryUser/EntryUser/Outline/Polygon
IPC-2581/Content/DictionaryUser/EntryUser/Outline/Polygon/PolyBegin
IPC-2581/Content/DictionaryUser/EntryUser/Outline/Polygon/PolyStepCurve
IPC-2581/Content/DictionaryUser/EntryUser/Outline/Polygon/PolyStepSegment
IPC-2581/Content/DictionaryUser/EntryUser/Outline/LineDesc
IPC-2581/Content/DictionaryUser/EntryUser/Outline/LineDescRef
IPC-2581/Content/DictionaryUser/EntryUser/Polyline
IPC-2581/Content/DictionaryUser/EntryUser/Polyline/PolyBegin
IPC-2581/Content/DictionaryUser/EntryUser/Polyline/PolyStepCurve
IPC-2581/Content/DictionaryUser/EntryUser/Polyline/PolyStepSegment
IPC-2581/Content/DictionaryUser/EntryUser/Polyline/LineDesc
IPC-2581/Content/DictionaryUser/EntryUser/Polyline/LineDescRef
IPC-2581/Content/DictionaryUser/EntryUser/Text

IPC-2581/Content/DictionaryUser/EntryUser/Text/Xform
IPC-2581/Content/DictionaryUser/EntryUser/Text/BoundingBox
IPC-2581/Content/DictionaryUser/EntryUser/Text/FontRef
IPC-2581/Content/DictionaryUser/EntryUser/Text/Color
IPC-2581/Content/DictionaryUser/EntryUser/Text/ColorRef
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IPC-2581/Content/DictionaryUser/EntryUser/UserSpecial/Butterfly
IPC-2581/Content/DictionaryUser/EntryUser/UserSpecial/Circle
IPC-2581/Content/DictionaryUser/EntryUser/UserSpecial/Contour
IPC-2581/Content/DictionaryUser/EntryUser/UserSpecial/Contour/Polygon
IPC-2581/Content/DictionaryUser/EntryUser/UserSpecial/Contour/Polygon/PolyBegin
IPC-2581/Content/DictionaryUser/EntryUser/UserSpecial/Contour/Polygon/PolyStepCurve
IPC-2581/Content/DictionaryUser/EntryUser/UserSpecial/Contour/Polygon/PolyStepSegment
IPC-2581/Content/DictionaryUser/EntryUser/UserSpecial/Contour/Cutout
IPC-2581/Content/DictionaryUser/EntryUser/UserSpecial/Contour/Cutout/PolyBegin
IPC-2581/Content/DictionaryUser/EntryUser/UserSpecial/Contour/Cutout/PolyStepCurve
IPC-2581/Content/DictionaryUser/EntryUser/UserSpecial/Contour/Cutout/PolyStepSegment
IPC-2581/Content/DictionaryUser/EntryUser/UserSpecial/Diamond
IPC-2581/Content/DictionaryUser/EntryUser/UserSpecial/Donut
IPC-2581/Content/DictionaryUser/EntryUser/UserSpecial/Ellipse
IPC-2581/Content/DictionaryUser/EntryUser/UserSpecial/Hexagon
IPC-2581/Content/DictionaryUser/EntryUser/UserSpecial/Moire
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IPC-2581/Content/DictionaryUser/EntryUser/UserSpecial/RectCham
IPC-2581/Content/DictionaryUser/EntryUser/UserSpecial/RectCorner
IPC-2581/Content/DictionaryUser/EntryUser/UserSpecial/RectRound
IPC-2581/Content/DictionaryUser/EntryUser/UserSpecial/Thermal
IPC-2581/Content/DictionaryUser/EntryUser/UserSpecial/Triangle
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IPC-2581/Content/DictionaryUser/EntryUser/UserSpecial/UserPrimitiveRef
IPC-2581/Content/DictionaryFont
IPC-2581/Content/DictionaryFont/EntryFont
IPC-2581/Content/DictionaryFont/EntryFont/FontDefEmbedded
IPC-2581/Content/DictionaryFont/EntryFont/FontDefEmbedded/LineDesc
IPC-2581/Content/DictionaryFont/EntryFont/FontDefEmbedded/LineDescRef
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IPC-2581/Content/DictionaryFont/EntryFont/FontDefEmbedded/Glyph/Line/LineDesc
IPC-2581/Content/DictionaryFont/EntryFont/FontDefEmbedded/Glyph/Line/LineDescRef
IPC-2581/Content/DictionaryFont/EntryFont/FontDefEmbedded/Glyph/Outline
IPC-2581/Content/DictionaryFont/EntryFont/FontDefEmbedded/Glyph/Outline/Polygon
IPC-2581/Content/DictionaryFont/EntryFont/FontDefEmbedded/Glyph/Outline/Polygon/PolyBegin
IPC-2581/Content/DictionaryFont/EntryFont/FontDefEmbedded/Glyph/Outline/Polygon/PolyStepCurve
IPC-2581/Content/DictionaryFont/EntryFont/FontDefEmbedded/Glyph/Outline/Polygon/PolyStepSegment
IPC-2581/Content/DictionaryFont/EntryFont/FontDefEmbedded/Glyph/Outline/LineDesc
IPC-2581/Content/DictionaryFont/EntryFont/FontDefEmbedded/Glyph/Outline/LineDescRef
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IPC-2581/Content/DictionaryFont/EntryFont/FontDefEmbedded/Glyph/Polyline/PolyBegin
IPC-2581/Content/DictionaryFont/EntryFont/FontDefEmbedded/Glyph/Polyline/PolyStepCurve
IPC-2581/Content/DictionaryFont/EntryFont/FontDefEmbedded/Glyph/Polyline/PolyStepSegment
IPC-2581/Content/DictionaryFont/EntryFont/FontDefEmbedded/Glyph/Polyline/LineDesc
IPC-2581/Content/DictionaryFont/EntryFont/FontDefEmbedded/Glyph/Polyline/LineDescRef
IPC-2581/Content/DictionaryFont/EntryFont/FontDefExternal
IPC-2581/Content/DictionaryLineDesc
IPC-2581/Content/DictionaryLineDesc/EntryLineDesc
IPC-2581/Content/DictionaryLineDesc/EntryLineDesc/LineDesc
IPC-2581/Content/DictionaryColor

IPC-2581/Content/DictionaryColor/EntryColor
IPC-2581/Content/DictionaryColor/EntryColor/Color
IPC-2581/Content/DictionaryFirmware
IPC-2581/Content/DictionaryFirmware/EntryFirmware
IPC-2581/Content/DictionaryFirmware/EntryFirmware/CachedFirmware

Logistic Header Elements
IPC-2581/LogisticHeader
IPC-2581/LogisticHeader/Role
IPC-2581/LogisticHeader/Enterprise
IPC-2581/LogisticHeader/Person

History Record Elements
IPC-2581/HistoryRecord
IPC-2581/HistoryRecord/FileRevision
IPC-2581/HistoryRecord/FileRevision/SoftwarePackage
IPC-2581/HistoryRecord/FileRevision/SoftwarePackage/Certification
IPC-2581/HistoryRecord/ChangeRec
IPC-2581/HistoryRecord/ChangeRec/Approval